# Spot Safety Project Evaluation

Project Log # 200704298

Spot Safety Project # 05-00-217

**Spot Safety Project Evaluation of the Traffic Signal Revision and Construction of a Left Turn Lane at the Intersection of SR 1349 (Dillard Dr) and SR 1319 (Jones Franklin Rd) Wake County**

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

**Principal Investigator**

_____ 11/13/07
Brad Robinson, EI Date

Traffic Safety Project Engineer

# *Spot Safety Project Evaluation Documentation*

## Subject Location

Evaluation of Spot Safety Project Number 05-00-217 – The Intersection of SR 1319 (Jones Franklin Rd) and SR 1349 (Dillard Dr) in Wake County.

## Project Information and Background from the Project File Folder

The spot safety project improvement countermeasures chosen for the subject location was to revise the traffic signals in order to provide protected-permitted left-turn phasing for eastbound SR 1349 (Dillard Dr) and southbound SR 1319 (Jones Franklin). In addition, a grass median on eastbound SR 1349 was removed and a left turn lane was added.

The subject location is a four-leg intersection which was controlled by a signal in both the before and after period. Both approaches of SR 1319 (Jones Franklin) have a through-right and a left turn lane. Westbound SR 1349 (Dillard Dr) has a single approach lane. Eastbound SR 1349 had a through-left and a right turn lane in the before period, with the addition of an exclusive left turn lane in the after period. The speed limit is 45 mph for all approaches except westbound SR 1349, which is 35 mph.

The original study was conducted at the request of a several private citizens. There are 2 schools in the vicinity of the intersection as well as several subdivisions. Traffic, including school buses, would queue up at the intersection, especially just before and after school hours. It was noted that on eastbound SR 1349 traffic would get so backed up waiting on vehicles to turn left that other drivers would use the exclusive right turn lane to illegally pass the left turning vehicles.

The initial crash analysis was conducted from May 1, 1997 to April 30, 2000 with a total of 22 crashes, 10 of which were Left Turn-Same Roadway Crashes and considered correctable by the chosen countermeasure. The final completion date for the improvements at the subject intersection was on April 11, 2002 with a total cost of $57,000.00.

## Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from February 1, 2002 to May 31, 2002. The before period consisted of reported crashes from March 1, 1997 through January 31, 2002 (4 years and 11 months) and the after period consisted of reported crashes from June 1, 2002 through April 30, 2007 (4 years and 11 months). The ending date for this analysis was limited by the available crash data at the time the analysis was conducted.

The treatment data consisted of all reported crashes within 150 feet of the subject intersection. The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that there were two types of Target Crashes for the chosen countermeasure. The first

was Left Turn-Same Roadway Crashes involving left turning vehicles from eastbound SR 1349 (Dillard Dr). The second was Left Turn-Same Roadway Crashes involving left turning vehicles from southbound SR 1319 (Jones Franklin Rd). The target crashes are clearly identified in the before and after period collision diagrams.

| **Treatment Information** | | | |
|---|---|---|---|
| | **Before** | **After** | **Percent Reduction (-) Percent Increase (+)** |
| Total crashes | 50 | 35 | -30.0 |
| Total Severity Index | 4.4 | 3.54 | -19.5 |
| | | | |
| EB Left Turn-Same Roadway | 19 | 0 | -100.0 |
| EB Left Turn-Same Crash Severity Index | 5.28 | 0 | -100.0 |
| | | | |
| SB Left Turn-Same Roadway | 6 | 3 | -50.0 |
| SB Left Turn-Same Crash Severity Index | 4.7 | 3.47 | -26.2 |
| | | | |
| Volume | 19,400 | 24,500 | 26.3 |
| | | | |
| **Crash Severity Summary** | | | |
| Fatal Crashes | 0 | 0 | N/A |
| Class A Crashes | 0 | 0 | N/A |
| Class B Crashes | 3 | 1 | -66.7 |
| Class C Crashes | 20 | 11 | -45.0 |
| PDO Crashes | 27 | 23 | -14.8 |

The naive before and after analysis at the treatment location resulted in a 30 percent decrease in Total Crashes, a 100 percent decrease in eastbound Left Turn-Same Roadway Crashes, a 50 percent decrease in southbound Left Turn-Same Roadway Crashes, and a 26 percent increase in Average Daily Traffic (ADT). The before period ADT year was 1999 and the after period ADT year was 2004.

**Results and Discussion**

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 30 percent decrease in Total Crashes, a 100 hundred percent decrease in eastbound SR 1349 Left Turn-Same Roadway Crashes, and a 50 percent decrease in southbound SR 1319 Left Turn-Same Roadway Crashes. The summary results above demonstrate that Total Crashes and both types of Target Crashes appear to have decreased at the treatment location from the before to the after period, despite a noticeable increase in ADT.

It is apparent from the above table and the *Collision Diagrams* that the revision of the traffic signal and the addition of a left turn lane were effective in reducing Left Turn-Same Roadway Crashes at the intersection. The combination of the left turn lane and protected-permitted phasing for eastbound SR 1349 eliminated the large Left Turn-Same Roadway crash pattern involving eastbound left turns. Not only does the protected phase allow the left turning vehicles to make their movement unobstructed, but the exclusive left turn lane allows the vehicles a place of refuge without having impatient drivers queuing up behind them.

Angle Crashes appear to have increased at the intersection from the before to the after period. In the before period there were six total angle crashes in the intersection while in the after period there were 13 total angle crashes, for an increase of 117 percent. The vast majority of these crashes appear to result from a vehicle on SR 1349 running the signal (12 of 13, after period). After further reviewing the crash reports of these 12 crashes, it was determined that all of them occurred between the hours 11:00 p.m. and 4:00 a.m. Ten of the 12 crashes explicitly stated that the signal was operating under flash conditions at the time of the crash. The last of these crashes occurred in September of 2004. According to the city of Cary, they took over maintenance of this signal in 2005 and it has not operated under flash condition since they have maintained it.

The calculated benefit to cost ratio for this project is 6.58 considering total crashes. The benefit to cost ratio considering only target crashes is 7.86. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of roadway.

# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1349 and SR 1319 BY: Brad Robinson
COUNTY: Wake DATE: 10/25/2007
FILE NO.: SS 05-00-217

DETAILED COST: TYPE IMPROVEMENT - Signal Revision (protected-permitted) and Left Turn Lane

| ITEMS | TOTAL | SERVICE | CRF | ANNUAL COST |
|---|---|---|---|---|
| Construction | $57,000 | 15 | 0.117 | $6,659 |
| | $0 | 0 | 0.000 | $0 |
| Right-of-Way | $0 | 0 | 0.000 | $0 |
| TOTALS | $57,000 | 15 | 0.117 | $6,659 |

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $0
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $300

TOTAL ANNUAL COST= $6,959
TOTAL COST OF PROJECT= $57,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

| TIME PERIOD | YEARS | K & A CRASHES | K & A CRASHES PER YR | B & C CRASHES | B & C CRASHES PER YR | PDO CRASHES | PDO CRASHES PER YR | ANNUAL COSTS |
|---|---|---|---|---|---|---|---|---|
| BEFORE | 4.92 | 0 | 0.00 | 23 | 4.67 | 27 | 5.49 | $111,321 |
| AFTER | 4.92 | 0 | 0.00 | 12 | 2.44 | 23 | 4.67 | $65,508 |

Annual Benefits from Crash Cost Savings $45,813

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $38,854

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 6.58

TOTAL COST OF PROJECT - $57,000 COMPREHENSIVE B/C RATIO - 6.58

# BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: SR 1349 and SR 1319 | BY: Brad Robinson
COUNTY: Wake | DATE: 10/25/2007
FILE NO.: SS 05-00-217 | Target

DETAILED COST: TYPE IMPROVEMENT - Signal Revision (protected-permitted) and Left Turn Lane

| ITEMS | TOTAL | SERVICE | CRF | ANNUAL COST |
|---|---|---|---|---|
| Construction | $57,000 | 15 | 0.117 | $6,659 |
| | $0 | 0 | 0.000 | $0 |
| Right-of-Way | $0 | 0 | 0.000 | $0 |
| TOTALS | $57,000 | 15 | 0.117 | $6,659 |

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $0
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $300

TOTAL ANNUAL COST= $6,959
TOTAL COST OF PROJECT= $57,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

| TIME PERIOD | YEARS | K & A CRASHES | K & A CRASHES PER YR | B & C CRASHES | B & C CRASHES PER YR | PDO CRASHES | PDO CRASHES PER YR | ANNUAL COSTS |
|---|---|---|---|---|---|---|---|---|
| BEFORE | 4.92 | 0 | 0.00 | 13 | 2.64 | 12 | 2.44 | $60,203 |
| AFTER | 4.92 | 0 | 0.00 | 1 | 0.20 | 2 | 0.41 | $5,528 |

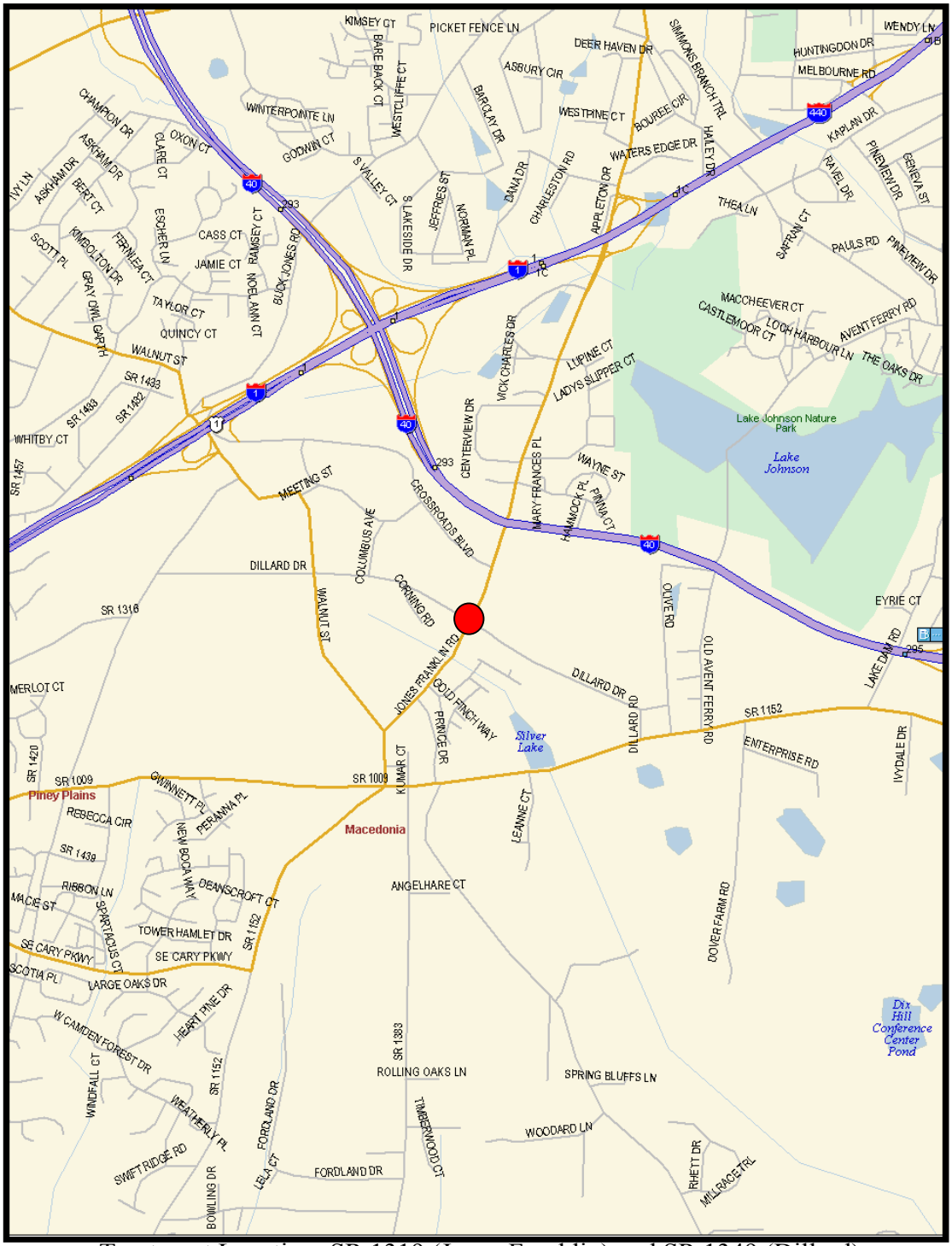
Annual Benefits from Crash Cost Savings $54,675

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $47,716

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 7.86

TOTAL COST OF PROJECT - $57,000 COMPREHENSIVE B/C RATIO - 7.86

Location Map
Wake County
Evaluation of Spot Safety Project #05-00-217




Treatment Location: SR 1319 (Jones Franklin) and SR 1349 (Dillard)

Treatment Site Photos Taken October 19, 2007

Driving Eastbound on SR 1349 (Dillard Dr)

Driving Eastbound on SR 1349 (Dillard Dr)

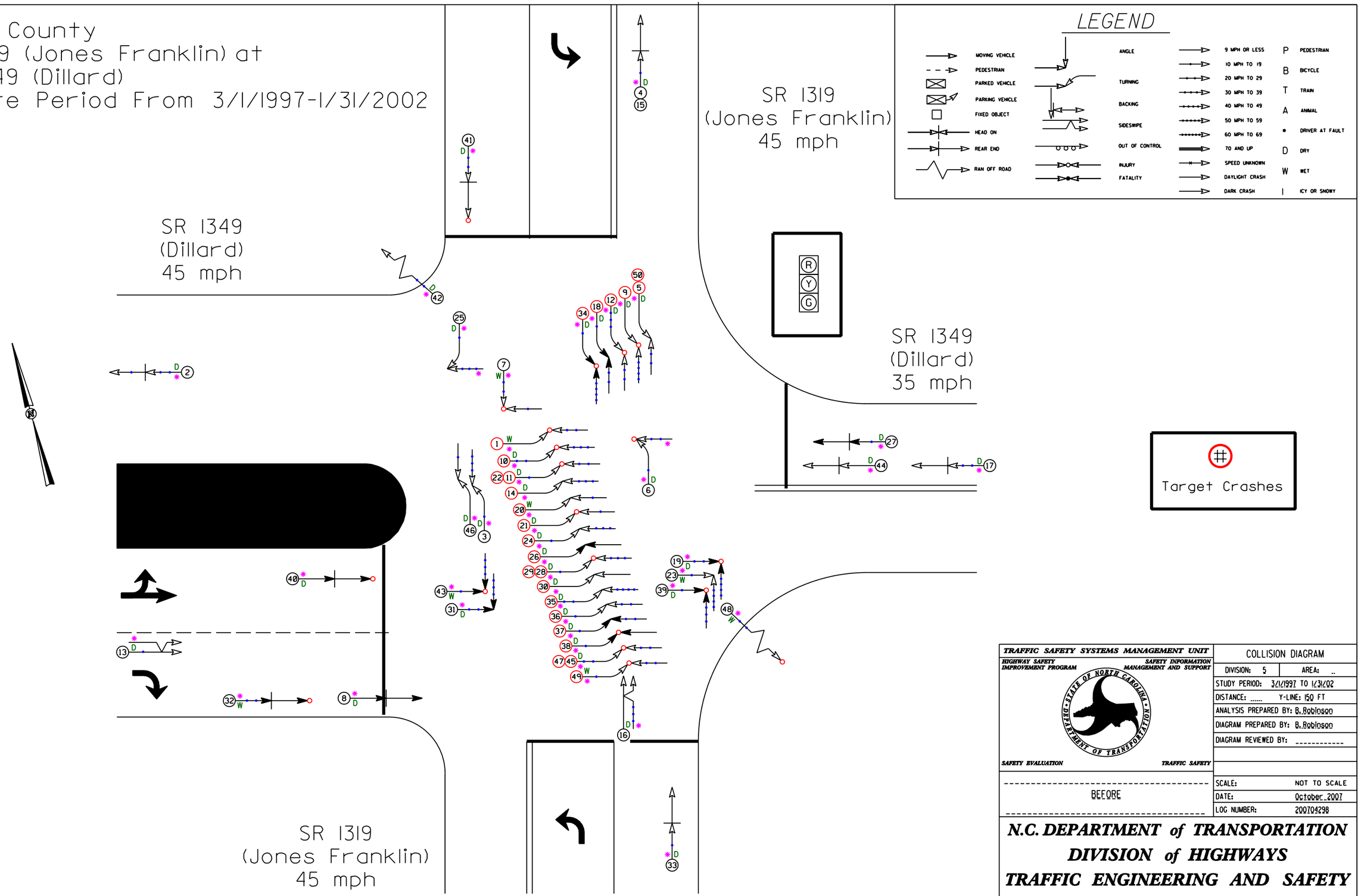
Driving Southbound on SR 1319 (Jones Franklin Rd)


Driving Southbound on SR 1319 (Jones Franklin Rd)

Driving Westbound on SR 1349 (Dillard Dr)

Driving Northbound on SR 1319 (Jones Franklin Rd)

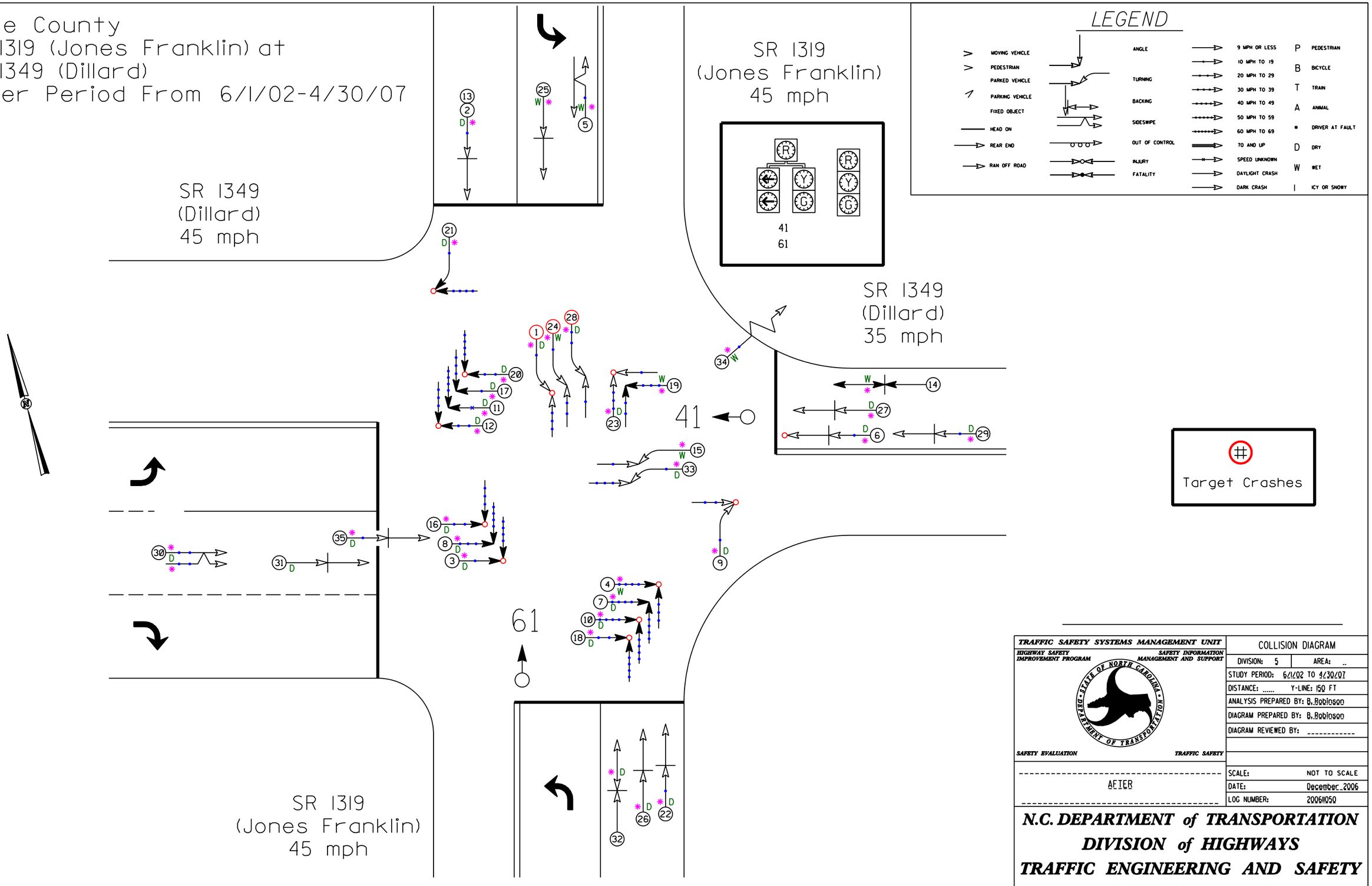
# Wake County
# SR 1319 (Jones Franklin) at
# SR 1349 (Dillard)
# Before Period From 3/1/1997-1/31/2002




| TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT | COLLISION DIAGRAM | |
|---|---|---|
| HIGHWAY SAFETY IMPROVEMENT PROGRAM / SAFETY INFORMATION MANAGEMENT AND SUPPORT | DIVISION: 5 | AREA: .. |
| | STUDY PERIOD: | 3/1/1997 TO 1/31/02 |
| | DISTANCE: ..... | Y-LINE: 150 FT |
| | ANALYSIS PREPARED BY: | B.Robinson |
| | DIAGRAM PREPARED BY: | B.Robinson |
| | DIAGRAM REVIEWED BY: | _____ |
| SAFETY EVALUATION / TRAFFIC SAFETY | | |
| BEFORE | SCALE: | NOT TO SCALE |
| | DATE: | October 2007 |
| | LOG NUMBER: | 200704298 |

**N.C. DEPARTMENT of TRANSPORTATION**
**DIVISION of HIGHWAYS**
**TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH**

Wake County
SR 1319 (Jones Franklin) at
SR 1349 (Dillard)
After Period From 6/1/02-4/30/07




TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
HIGHWAY SAFETY IMPROVEMENT PROGRAM
SAFETY INFORMATION MANAGEMENT AND SUPPORT
SAFETY EVALUATION
TRAFFIC SAFETY

AFIER

COLLISION DIAGRAM

| | |
|---|---|
| DIVISION: 5 | AREA: .. |
| STUDY PERIOD: 6/1/02 TO 4/30/07 | |
| DISTANCE: ..... | Y-LINE: 150 FT |
| ANALYSIS PREPARED BY: B.Robinson | |
| DIAGRAM PREPARED BY: B.Robinson | |
| DIAGRAM REVIEWED BY: _____ | |
| SCALE: | NOT TO SCALE |
| DATE: | December 2006 |
| LOG NUMBER: | 20061050 |

**N.C. DEPARTMENT of TRANSPORTATION**
**DIVISION of HIGHWAYS**
**TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH**